pickering

USER MANUAL

Model No. **20-520/20-525**

R.F. Matrix Module with Self-Test

Designed & Manufactured by:-

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HELP!!!

If you need assistance with your Pickering Interfaces Switching System: *Switching problems, Programming or Integration within your Test System. – Please ring Pickering Interfaces and ask for "Technical Support".*

Alternatively you may fax, email or connect to our Internet Web Site.

A full set of operating manuals, application notes and software drivers is available on CD ROM.

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Section 1
High Density Matrix Modules

1.1 Features

- High Isolation RF Switching Matrix, Available in 16 x 4 and 8 x 8 Configurations.
- Single Pole Version Available in 50Ω or 75Ω Version with 100MHz Bandwidth
- Double Pole Version Available with 50Ω Triaxial Connectors.
- Full Matrix Self-Test for Total Switch Contact Confidence.
- On-Board Isolation Switches Remove Unused Crosspoint Rows/Columns.
- Large Low Frequency Matrices Easily Built Up Using Internal 24 Pole Analogue Bus.
- Up to 31 Matrix Modules May Be Cascaded to Form Matrices with Sizes to Over 2000 Crosspoints.
- Very Large Partially Filled Matrices May Be Constructed When Used In Conjunction with 20-700 Series RF Multiplexer Modules.
- Front Panel Mounted BNC Co-Axial Connectors.
- Two Reed Switch Types: Standard Dry or Ruthenium.
- Switch up to 100Vd.c., 10W, 0.5A (1.2A carry).

1.1.1 Matrix Description

This manual covers all models in the 20-520 range of Very High Isolation Matrix Modules switching frequencies to beyond 100MHz, available in both 50Ω & 75Ω versions. Also suitable for high accuracy, low frequency instrumentation requiring good isolation/noise performance. Built-In Self-Test gives complete switch confidence.

System 20 High Isolation RF Matrix Modules are intended for easy construction of high performance matrix switching systems; modules may be simply cascaded to form matrices of almost any size.

Connections are made via industry standard BNC connectors. Larger low frequency matrices are easily constructed using the internal 24 pole guarded analogue bus. **Isolation Switches** on each module remove all unselected columns and rows from the system, maximising both isolation and RF performance.

Full Self-Test is performed both at power up and at any other time either manually or under program control. **Self-Test** is of particular importance in large systems where relay contact integrity is a very major consideration. In the unlikely event of relay failure (either high on-state or low off-state resistance) the front panel will indicate a fault. The diagnosis - including the position of the suspect relay - will be indicated using the DIAGNOSTIC? command.

For a summary of switching capabilities please refer to tables 1.1 & 1.2.

This is a double height module and **must** be mounted into a double height (6U) case: Available case types: 10-934, 10-936 20-930 and 20-935.

1.1.2 Applications

Main applications will be for very high quality switching where standard matrix units have inadequate RF and isolation performance, these include: high quality data acquisition (usually 2 pole with frequencies < 1MHz), RF matrices (1 pole to beyond 100MHz), telecommunications and video applications (75Ω impedance) and high quality signal routing in functional ATE systems.

1.1.3 Front Panel

The module front panels are illustrated in Section 6, they comprise of three elements:

Status Display, 4 LED Indicators:-

Power LED.	Connected to power system supply.
Active LED.	On whenever one or more matrix switches are closed. For a list of all active switches use the VIEW? command.
Self-Test LED.	Active when self-test in progress.
Error LED.	Indicates that error found during self-test.

Self-Test Button. Press to initiate a self-test, this will first disconnect the matrix, then perform a full functional self-test, finally reconnecting the matrix when complete. While in progress the "Self-Test" LED will be on, if a failure is detected then the "Error" LED will be set on permanently. Use the DIAGNOSTIC? command to find the exact cause of any failure, refer to section 3 for further details. NB: Self-Test button will only respond when matrix is inactive (i.e. no crosspoints set).

Matrix Connectors. Provides connection to and from matrix, BNC Co-Axial and BNC Tri-Axial connectors, please refer to Section 6.

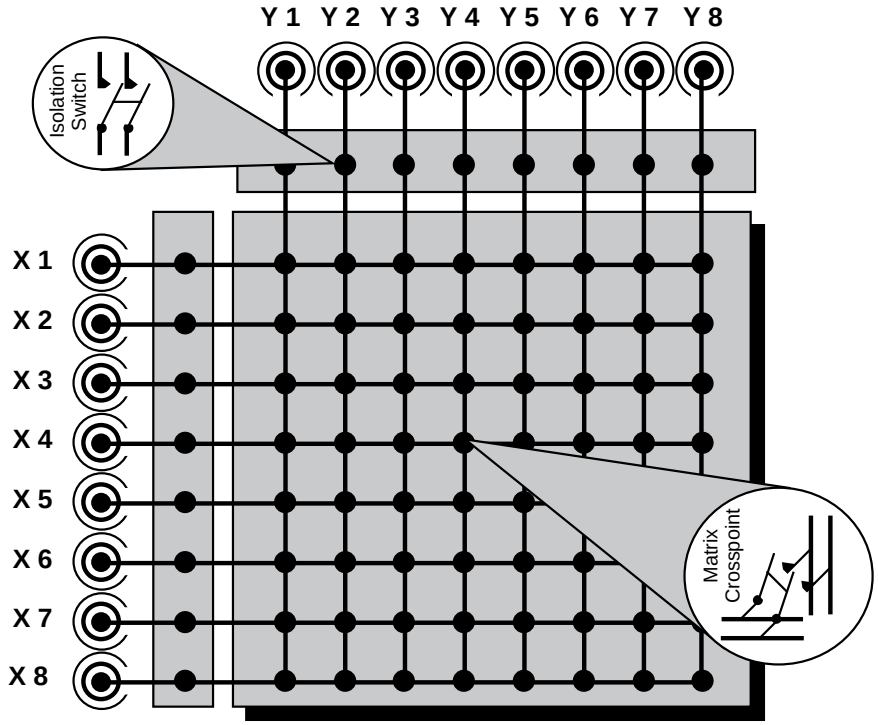


Fig 1.1 Matrix Schematic (8 x 8, 2 Pole)

Characteristic Impedance	50 or 75Ω
RF Specification For 1 Pole Version Only:	
Maximum Frequency	200MHz
Rise Time	< 1nS †
Insertion Loss (< 100MHz)	< 3dB †
V.S.W.R. (< 70MHz)	< 1:1.8 †
Isolation (< 100MHz)	> 75dB
Crosstalk (< 100MHz)	> 60dB
Maximum Voltage	100V d.c.
Maximum Power	10W
Maximum Switch Current	0.5A
Maximum Carry Current	1.2A
On Path Resistance	< 500 mΩ
Off Path Resistance	> 10^9 Ω
Noise	< -75dBm
Differential Thermal Offset	< 20μV
Capacitance: Open Channel to Ground	< 40pF
Capacitance: Selected Channel to Ground	< 70pF
Capacitance: Open Input to Output	< 4pF
Expected Life (Low Power)	> $1x10^8$ ops
Expected Life (Max Power)	> $5x10^6$ ops
Switching Time	< 10mS

Table 1.1 Switching Specification

† RF Performance is entirely dependant upon the combination of crosspoints currently selected, these figures are for one selected crosspoint only, please refer to graphs in Sec 1.4.

1.2 Matrix Module Model Numbers

The following table lists the standard options available with the matrix module:-

Config-uration	Connect Type	Imdep-ance	No. of Poles	Dry Reed Switch	Low Level Switch
16 x 4	BNC Coax	50Ω	1	20-520-501	20-520-521
16 x 4	BNC Triax	50Ω	2	20-520-502	20-520-522
16 x 4	BNC Coax	75Ω	1	20-520-701	20-520-721
8 x 4	BNC Coax	50Ω	1	20-522-501	20-522-521
8 x 4	BNC Triax	50Ω	2	20-522-502	20-522-522
8 x 4	BNC Coax	75Ω	1	20-522-701	20-522-721
8 x 8	BNC Coax	50Ω	1	20-525-501	20-525-521
8 x 8	BNC Triax	50Ω	2	20-525-502	20-525-522
8 x 8	BNC Coax	75Ω	1	20-525-701	20-525-721

Configuration Options † : -

–Y Y Coordinates connected to analogue bus.

–X X Coordinates connected to analogue bus

† Default configuration is no connections to internal analogue bus.

Further options (see notes below):

–R Limiting Resistor (e.g. 20-525-701-R).

–L Loop Through Option: All of the above modules are available with a loop through option, see diagram, frequently used in the construction of large self terminating RF matrices. Please order option -L (e.g. 20-525-501-L)

Further options are available for interconnecting matrix modules to form very large matrices, please contact factory to discuss your application in more detail.

All reed relay switching modules have the facility for a built in limiting resistor on each switch. This can be very useful in preventing high current in-rushes which may result in damage to the reed switch. These links are normally shorted, however when ordering you may specify limiting resistors if you wish, option -R.

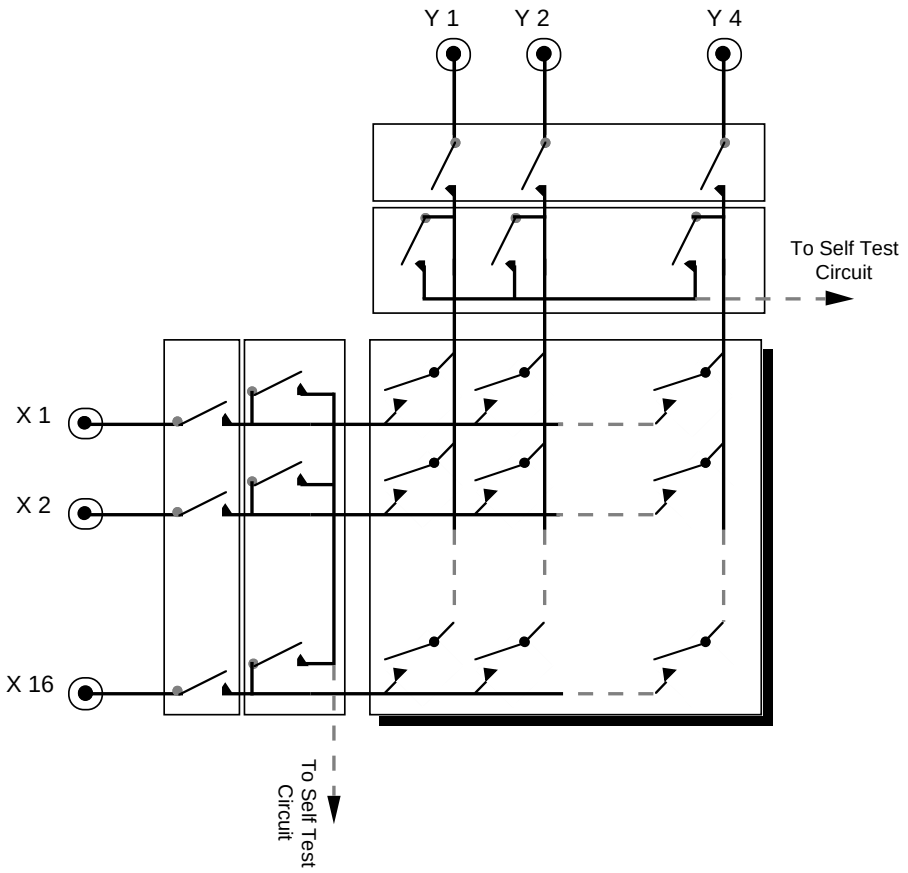


Fig 1.2 Full Schematic of 16 x 4 Single Pole Matrix Module

(104 Relays with 64 used in main Cross-Point Matrix)

1.3 Reed Switch & Connector Options

A summary of these modules capability is in tables 1.1 and 1.2.

Additional data is included below:-

1.3.1 Dry Reed Switch

Reed Relay Type 50Ω 1/2 Pole: 102M-1-A-12/1D

75Ω 1 Pole: 101-1-A-12/949D

Expected Life > 10^8 operations at low current/voltage load.

> $5x10^6$ at 260mA, 28V.

1.3.2 Low Level Ruthenium Reed Switch - *for low level signal use only*

Reed Relay Type 50Ω 1/2 Pole: 102M-1-A-12/2D

75Ω 1 Pole: 101-1-A-12/949D SW 2

Expected Life > 10^8 operations at low current/voltage load.

NB This switch is **not suitable** for switching high current loads.

1.3.3 Front Panel and Connectors

Two connector types are currently available, both are front panel mounted:-

1 Pole Version

16 x 4 Matrix: 20 x BNC Coaxial Connector Sockets, see Fig 6.1.

8 x 8 Matrix: 16 x BNC Coaxial Connector Sockets, see Fig 6.2.

2 Pole Version

16 x 4 Matrix: 20 x BNC Triax Connector Sockets, see Fig 6.1.

8 x 8 Matrix: 16 x BNC Triax Connector Sockets, see Fig 6.2.

Module width is 12 HP (2.4 inches, 60.8mm).

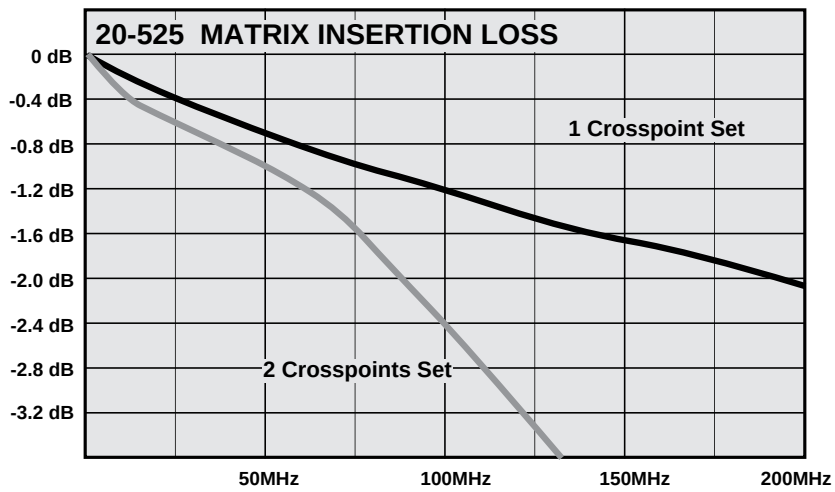
Front Panel layouts are illustrated in Section 6.

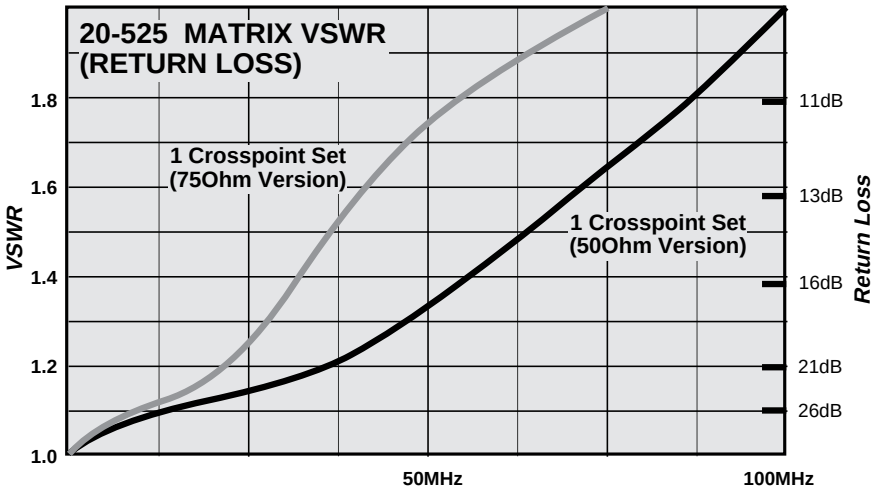
1.4 Typical RF Performance Plots (Single Pole Versions)

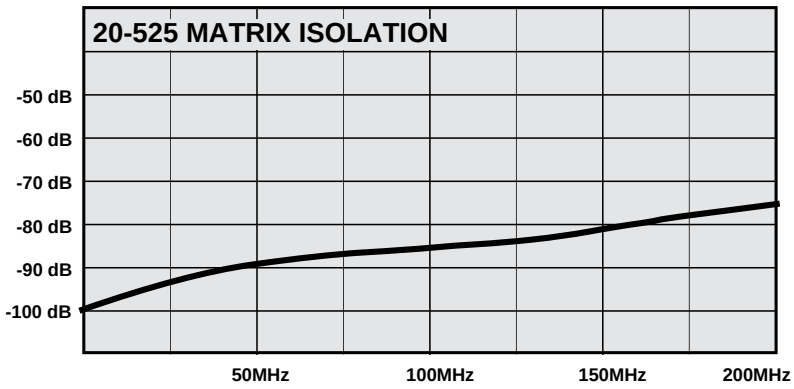
Typical RF Performance Plots for 20-525-501 (8 x 8, Single Pole)

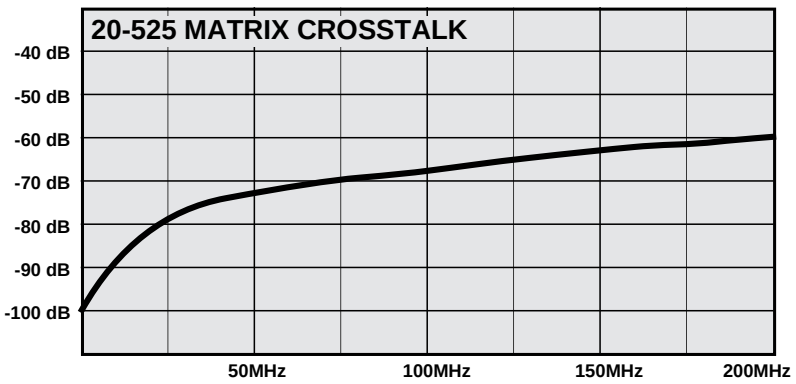
Curves are shown for matrix rows/columns with: 1 or 2 interconnected crosspoints set. For optimum insertion loss and VSWR (reflection) performance ensure only one crosspoint is set in any one row/column.

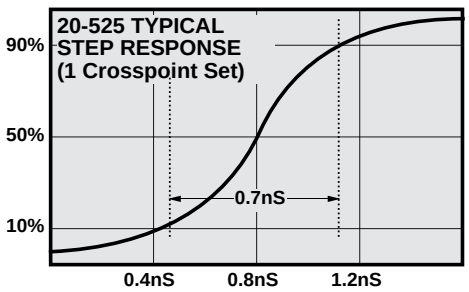
Performance curves for all versions of the single pole matrix modules have similar characteristics, any differences are shown. For further information please contact factory.




20-525 MATRIX VSWR
(RETURN LOSS)
1 Crosspoint Set
(75Ohm Version)
1 Crosspoint Set
(50Ohm Version)
VSWR
Return Loss
1.8
1.6
1.4
1.2
1.0
11dB
13dB
16dB
21dB
26dB
50MHz
100MHz


20-525 MATRIX ISOLATION
-50 dB
-60 dB
-70 dB
-80 dB
-90 dB
-100 dB
50MHz
100MHz
150MHz
200MHz


20-525 MATRIX CROSSTALK
-40 dB
-50 dB
-60 dB
-70 dB
-80 dB
-90 dB
-100 dB
50MHz
100MHz
150MHz
200MHz


20-525 TYPICAL
STEP RESPONSE
(1 Crosspoint Set)
90%
50%
10%
0.7nS
0.4nS
0.8nS
1.2nS

Section 2
Constructing Large Matrix Systems

2.1 Creating Large Matrices

Each System 20 interface can directly support cascaded matrices up to 128x16 or 32x64 using 16x4 matrix modules or up to 64x32 using 8x8 matrix modules, i.e. up to 31 modules per matrix, larger sizes can be supported using multiple System 20 interface modules mounted in separate cases.

Forming larger matrices is usually only a question of plugging in additional matrix modules, a 24 pole guarded analogue bus is provided on the System 20 Analogue Backplane. So constructing large matrices is very straight forward, no time consuming daisy-chained wiring harnesses. Further expansion is simply a matter of adding additional matrix modules, please refer to notes in Section 2.4.

All matrix modules in a cascaded matrix must have the same primary address, their position within the matrix is determined by their bank address (see sec 4.2, figs 2.1 & 2.2), this is set on an additional 5 way dip switch. The cascaded matrix is then programmed as a whole, the programmer does not need to address each matrix module individually, only a pair of coordinates for the required crosspoint need be sent.

2.2 Isolation Switches

Both the X and Y axes have on-board automatic isolation switches. In large matrix systems the parasitic capacitance associated with each cross-point switch can result in a large capacitance if several matrix modules are interconnected. The isolation switches only switch in those columns and rows on a module that contain an active switch. Thereby keeping matrix capacitance to a minimum., this may be important for applications requiring high isolation and crosstalk as well as good insulation resistance.

NB. These isolation switches are also used to remove the matrix from the external circuit when performing self-test.

2.3 “Partially Filled” Matrices

For users requiring very large matrix systems the cost of a fully populated matrix may prove prohibitive, in many instances a combination of multiplexer input/output and small “core” matrix may prove quite acceptable. This approach may prove to be more effective in terms of both cost and performance, the main draw backs being additional programming complexity and restricted matrix versatility (particularly for future unforeseen requirements). Please contact Pickering if you wish to discuss your matrix application in greater detail.

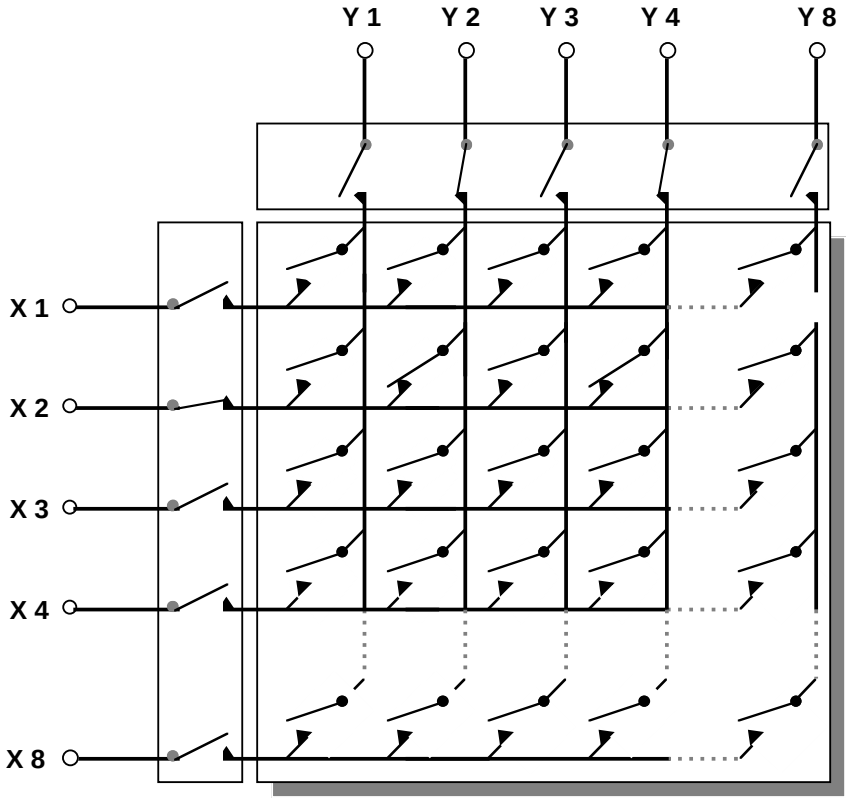
Pickering can build large Matrix systems constructed and tested to your exact requirements, (especially if your application involves switching RF or very high isolation signals), please contact sales office for further details.

2.4 Expanding an RF Matrix Using the Analogue Bus

If the signals being switches are not RF, typically < 1MHz bandwidth then using the analogue bus will be **very straightforward**. However, if RF frequencies (>1MHz) are being switches then particular attention must be paid to matrix interconnection.

If the analogue backplane bus is used to interconnect two or more matrices switching RF signals then return loss (VSWR) will be very severely affected (e.g. around 10dB at around 10MHz), insertion loss will also be degraded This is due to the effect of the long bus lines (typically 45cm in length). Performance can be maximised by interconnecting the matrix modules using the front panel mounted Coaxial connectors or by ordering a system with a reduced length analogue backplane bus (e.g. quarter length).

However if very low VSWR performance is required when switching RF signals, particularly in a large system, it may be worth looking at the Pickering Interface’s range of RF multiplexers, these can be used to construct very high performance matrix systems. Please contact factory for further information or advice.



Crosspoints Closed are at x = 2, y = 2 & x = 2, y = 4.

Fig 2.1 Typical Matrix (8 x 8 Single Pole) in Use with Automatic Isolation Switching

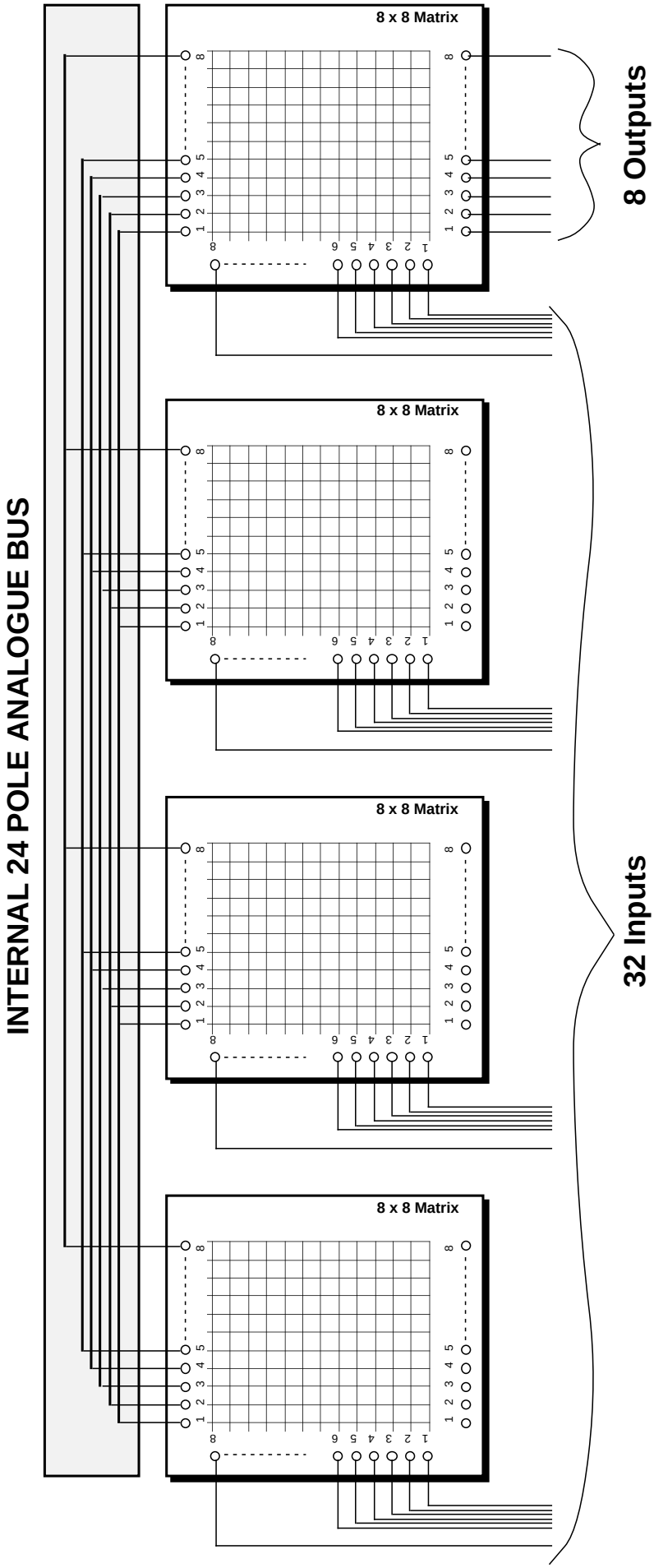


Fig 2.2 32 x 8 Matrix Switch

8 Poles of the internal guarded Analogue Bus are used to interconnect the 4 matrix modules. Additional matrix modules may be simply plugged in to give further expansion.

Section 3
Self Test

3.1 Self-Test Function

Self-Test is invoked at power on (taking up to 60 seconds) and may also be operated under software (*TST?) or via a recessed push button. Self-Test pass is indicated on a front panel LED with a full pass/fail description available using the DIAGNOSTIC? command.

Self-Test comprises 3 levels, see Fig 3.1:-

1. **Logic Test**: Checks all logic including on-board microprocessor, relay drivers etc.

2. **Relay Coil Test**: All reed relay coils are checked for continuity.

3. **Full Contact Test**: Tests all the relay contacts in the matrix block. Two test are undertaken:

(i) On-state resistance failure test. Fails if switch has on-state > 2Ω.

(iii) Off-state resistance test. A switch fails if it's isolation resistance is < $10^6\Omega$.

The threshold for contact resistance is preset to approximately 2Ω at the factory. However this threshold may set to customers precise requirements (from 200mΩ to 10Ω). If a very low threshold is selected, the self test could be used to detect switches which are not failing to operate but which have reached an end of life condition, where the contact resistance is starting to rise, indicating that the relay is due for replacement.

NB. The contact self test will only check the relay contacts in the core matrix block, isolation switches and self test switches are **not** tested, please refer to section 3.4 for further details.

Note: Fault diagnosis on 2 pole matrix modules will identify down to a pair of relays. Both these relays must be replaced, only the position of the first relay in the pair is given by the REPORT? command, please refer to Section 8.3.

3.2 Self-Test Operation

Self Test is always run at power on, taking approximately 60 seconds.

If self test is run under software control it will firstly **clear the whole matrix** (Manual Test will only function when the module is in a clear state). So it is very important to prepare your external instruments and U.U.T. for this! During self-test all isolation switches are opened so your external circuitry will see only very high resistance inputs.

When the self-test has finished the matrix will be returned to an all clear state (i.e. the previous state will not be remembered!).

Please note that because of the long self-test time that your computer may time out waiting for the test result (many PC's have default timeouts set to **10 seconds**).

3.3 Detailed Self Test Reporting using DIAGNOSTIC? Query

The DIAGNOSTIC? query will give an ASCII string detailing any self test failures. These will include:-

Logic: µP, RAM, EPROM, Relay Drivers, Invalid Link Settings etc.

Relay Coils: Open Circuit Coil.

Switch Contacts: High On Resistance, Low Off Resistance.

This string is not intended to be processed by the user's software, it is suitable for copying directly onto the screen of your control computer. This information will then indicate maintenance required (please contact Pickering for further help).

3.4 Self Test Limitations

Self Test covers all aspects of the Matrix Module which are liable to fail in normal use. The only exception to this are the following:-

"Isolation Relays": These switches are used to isolate the matrix from the users external circuitry, for this reason they cannot be included in the contact self test routine, refer to fig 2.1. These relays always "cold switch" (i.e. they are always operated without any load, as opposed to the matrix switches which always "hot switch"), therefore they should have an expected life in excess of 10^8 operations. These switches will only fail if a very heavy current is passed through the contacts (greater than around 3-4A for 10's of milliseconds, see section 5.1.1), this may result in switch weld to either an isolation or matrix switch. Please note that all relays including isolation and self test relays are included in the coil test, so an open circuit coil or faulty driver IC will be picked up and reported.

"Self Test Relays": There are self test relays on every x and y axis on the matrix board, if one of these contacts welds (very, unlikely) then all relays on that axis will appear to fail self test.

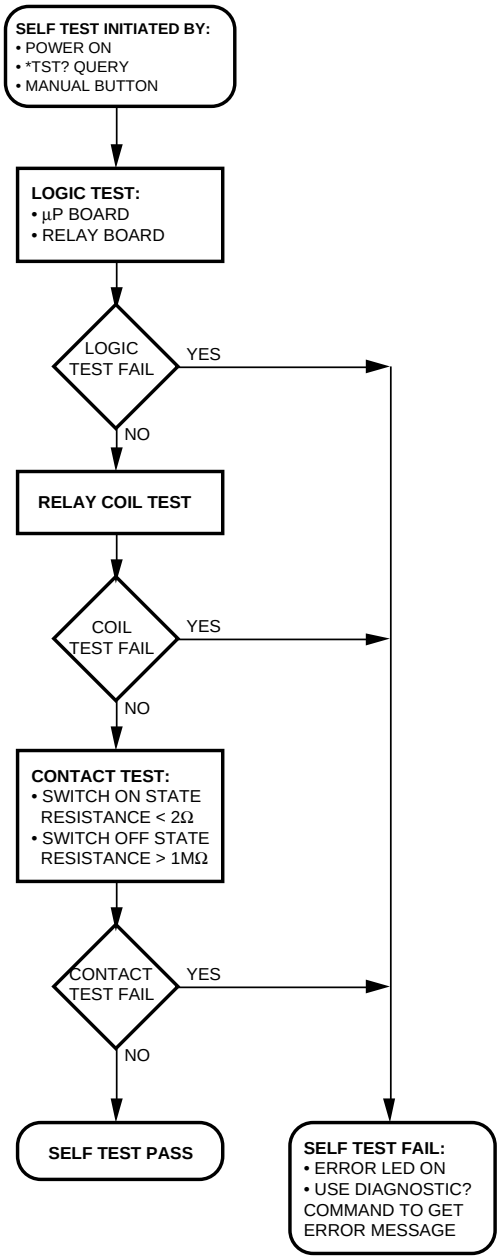


Fig 3.1 Self-Test: Basic Flow Diagram

Section 4
Programming

4.1 Select Module Address

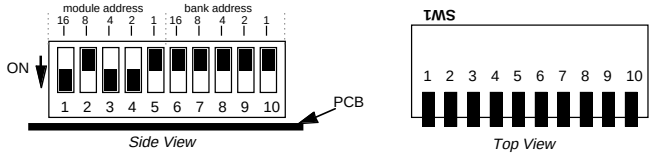
Choose module address (from 0 - 30) using the address select switch (SW1) on the top of the driver card (the top screen of the module may need to be removed to reveal the address switch).

The module address selected in the illustration is 22 (i.e. 16 + 4 + 2 = 22).

4.2 Select Module Bank Address

When more than one module is used to make up a large matrix (see Fig 1.2), where four 20 x 12 modules are used to make up a 40x24 matrix), then all matrix units **must** have the same module address, the location of each module within the matrix is given by its bank address. The matrix bank address is composed of two x and y components, see Fig 1.3 , these determine the individual matrix modules position within the larger matrix.

The bank address is constructed using 5 bits, see diagram, 3 bits for x and 2 bits for y. For example bit settings 0 0 1 0 0 represent bank address x = 1, y = 0.



There **must** always be a module present at the base address x = 0, y = 0, otherwise the matrix will not be recognised by the intelligent interface.

If there is a problem with any of the modules used to make up a large matrix then an error will be detected (use the DIAGNOSTIC? query to discover the cause).

4.3 Using the Intelligent GPIB Interface

X_2	X_1	X_0	Y_1	Y_0

Switching matrices are controlled using the MCLOSE and MOPEN commands:-

To close switch at position X = 17, Y = 9 on matrix with address 11.

MCLOSE 11,17,9

Now to look at status of matrix 11.

VIEW? 11 will return “17,9”

To open last switch and close switches at positions X = 1, Y = 1 and X = 2, Y = 1 on matrix 11.

MOPEN 11,17,9;MCLOSE 11,1,1;MCLOSE 11,2,1

Now to look at status of matrix 11.

VIEW? 11 will return “1,1;2,1”

To reset all switches on matrix 11.

ARESET 11

Now to look at status of matrix 11.

VIEW? 11 will return “0,0" - 0,0 indicates no coordinates set.

Note: The 10-920 Interface imposes a maximum limit allowing up to 100 crosspoints to be on at any one time (this is to prevent the power supply becoming overloaded).

4.4 Instruction Set

The Matrix module is very easy to program using the Model 10-920 IEEE-488.2 Interface:-

ARESET a Open all switches on device a

MCLOSE a,x,y Close switch at coordinates x,y on matrix a

MOPEN a,x,y Open switch at coordinates x,y on matrix a

RESET Open all switches on all modules

VIEW? a View status of device a.

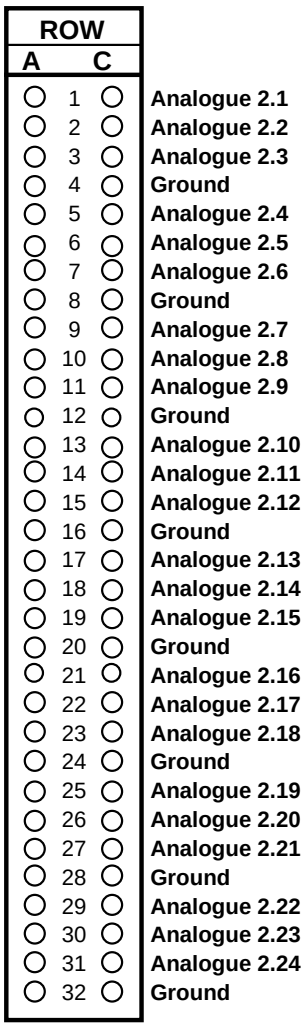
Self Test Functions:-

DIAGNOSTIC? Return diagnostic string (self test fail details, if any). Refer to Sec 3.3 for further details

*TST? Execute Full Self Test (IEEE-488.2 query)

4.5 Operating Speed

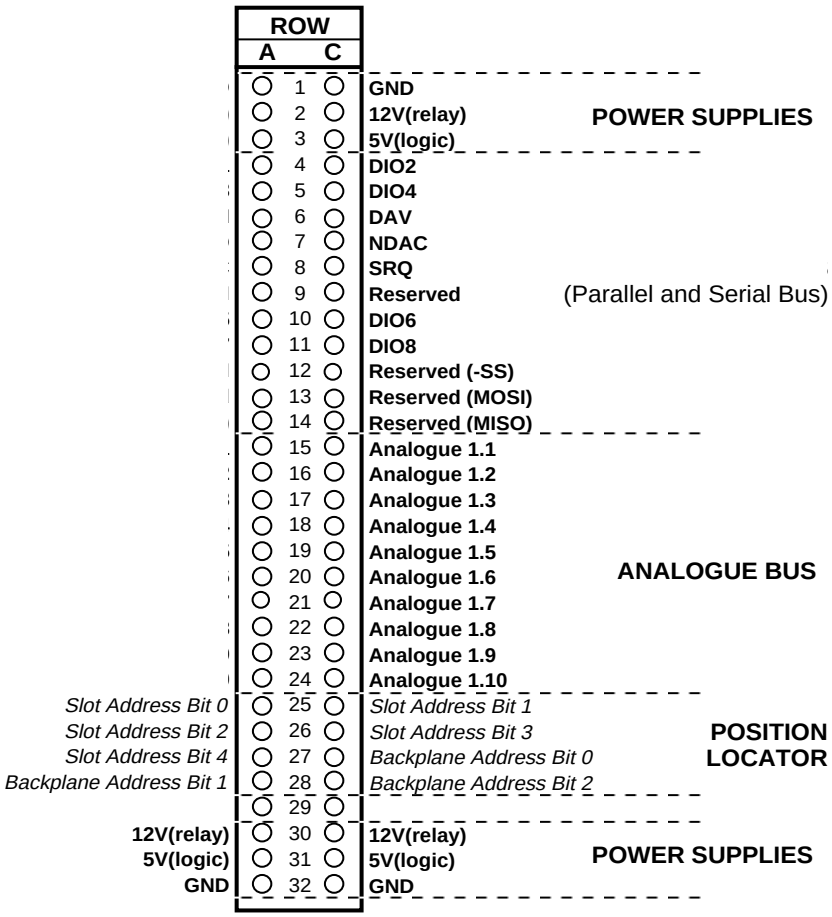
Maximum switching frequency is approximately 25mS to open or close any one crosspoint when using the 10-920 IEEE-488.2 Interface Module, the higher speed 10-921 interface reduces this time to 10mS.



A & C contacts are commoned. All analogue bus lines are surrounded by a grounded guard track to minimise inter–channel crosstalk.

Analogue Bus Approximate RF Characteristic Impedance = 65Ω.

Fig 5.1 24 Pole Internal Analogue Bus Connector
(Type: 64 Pin DIN 41612)



Note: The Analogue bus on this connector is not used by any matrix module (only multiplexers).
All analogue bus lines are surrounded by a grounded guard track to minimise inter–channel crosstalk.
Analogue Bus Approximate RF Characteristic Impedance = 65Ω.

Fig 5.2 Power/Control/Analogue Bus Connector
(Type: 64 Pin DIN 41612)

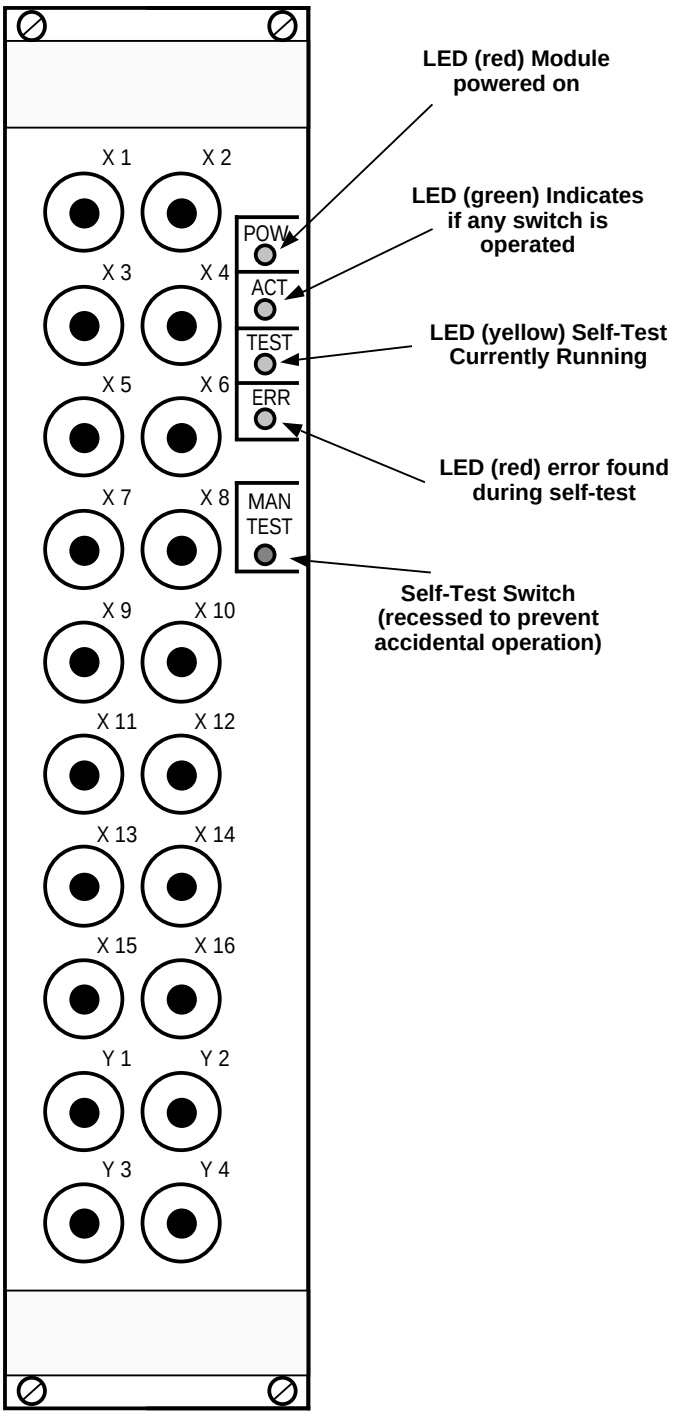


Fig 6.1 20-520 Front Panel, 16 x 4 Matrix

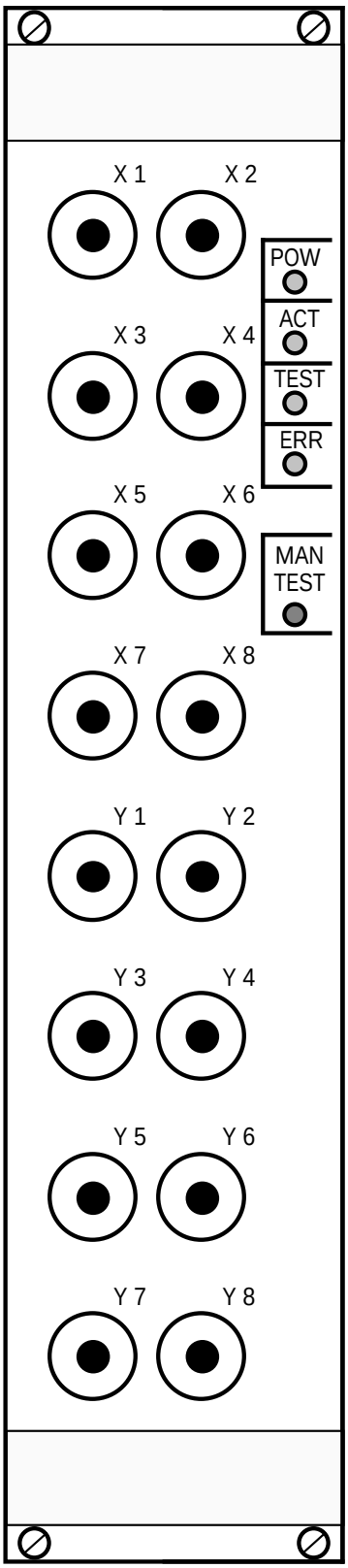


Fig 6.2 20-525 Front Panel, 8 x 8 Matrix

Section 7
Reconfiguring Driver Card to Your Application

Your multiplexer driver card will leave the factory preconfigured, so take **great care** if you wish to change any of the settings. If in doubt contact Pickering for further details.

7.1 Universal Driver Card: Configuration Links

Configuration switches are provided on the driver board at position SW2, on the top edge of the PCB, adjacent to the 10 way address selection lever switch. The five switches, see Fig 7.1, are used as follows:-

Relay Settling Time

There are four choices of relay settling time, this is to allow for different applications and relay types.

1	2	Relay Settling Time †
0	0	4.0ms
0	1	1.0ms - default setting
1	0	0.5ms
1	1	0.0ms

† The "Settled" line is triggered after this delay

Matrix Intelligent Isolation Switching

This will allow intelligent isolation switching, i.e. only those matrix rows and columns that have an active crosspoint switch will be connected in circuit. Note intelligent isolation switching may operate a little slower (up to around 5ms per operation because all isolation switches always cold switch).

3	4	5	Function
0	–	–	1 Pole Switching *(used for self test only)*
1	–	–	2 Pole Switching *(used for self test only)*
–	0	–	Enable Full Self Test (60 Seconds) - default setting
–	1	–	Enable Logic Only Self Test (5 Seconds)
–	–	0	Enable Automatic Isolation Switching - default setting
–	–	1	Disable Automatic Isolation Switching

7.2 Repeating Self Test with Burn In - *Factory Use Only*

A burn-in test facility is built into the module, this is initiated by pressing the selftest button until the Active LED goes on (around 5 seconds). Here the module will run the usual full selftest together with some additional isolation tests followed by 15 minutes of "switch rattling", the test procedure will then be repeated. This process may only be stopped by powering off or holding the manual test button in for several seconds.

This feature is for factory use where matrix modules are burned-in prior to undergoing final test.

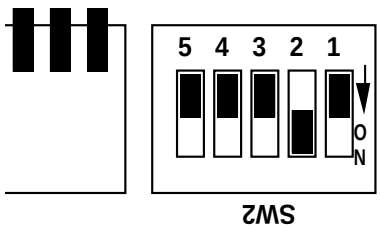


Fig 7.1 Driver Card Configuration Links on SW2

Section 8
Circuit Diagrams

Two sets of circuit diagrams and documentation are contained:-

• 8.1 Driver PCB Assembly

PCB Layout
Circuit Diagram (6 pages)
Inter PCB Connectors
Parts List

• 8.2 8 x 8 Single Pole Relay PCB Assembly

PCB Layout
Inter PCB Connectors
Parts List

• 8.3 8 x 8 Double Pole Relay PCB Assembly

PCB Layout
Parts List

D.1 Driver PCB Assembly

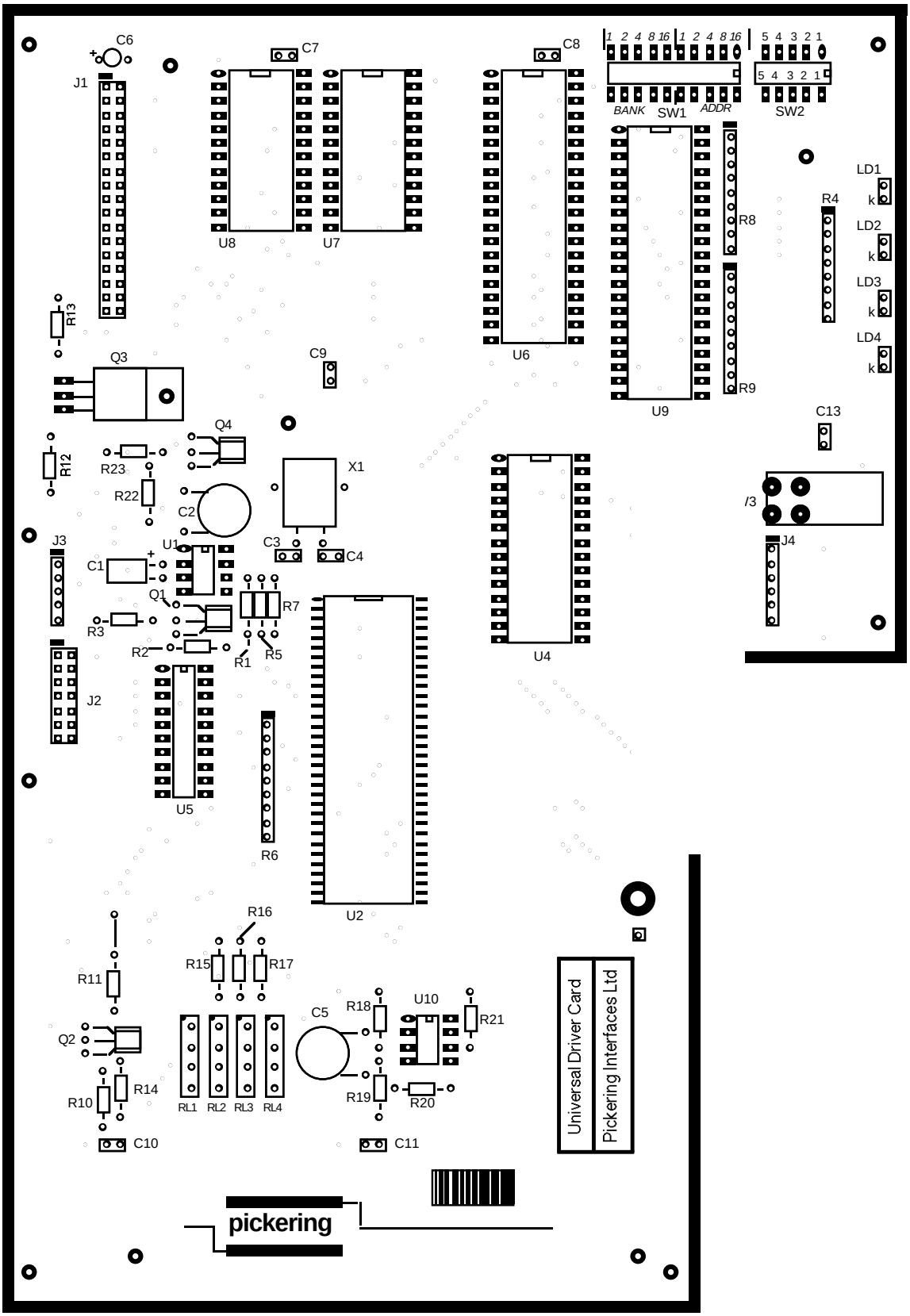
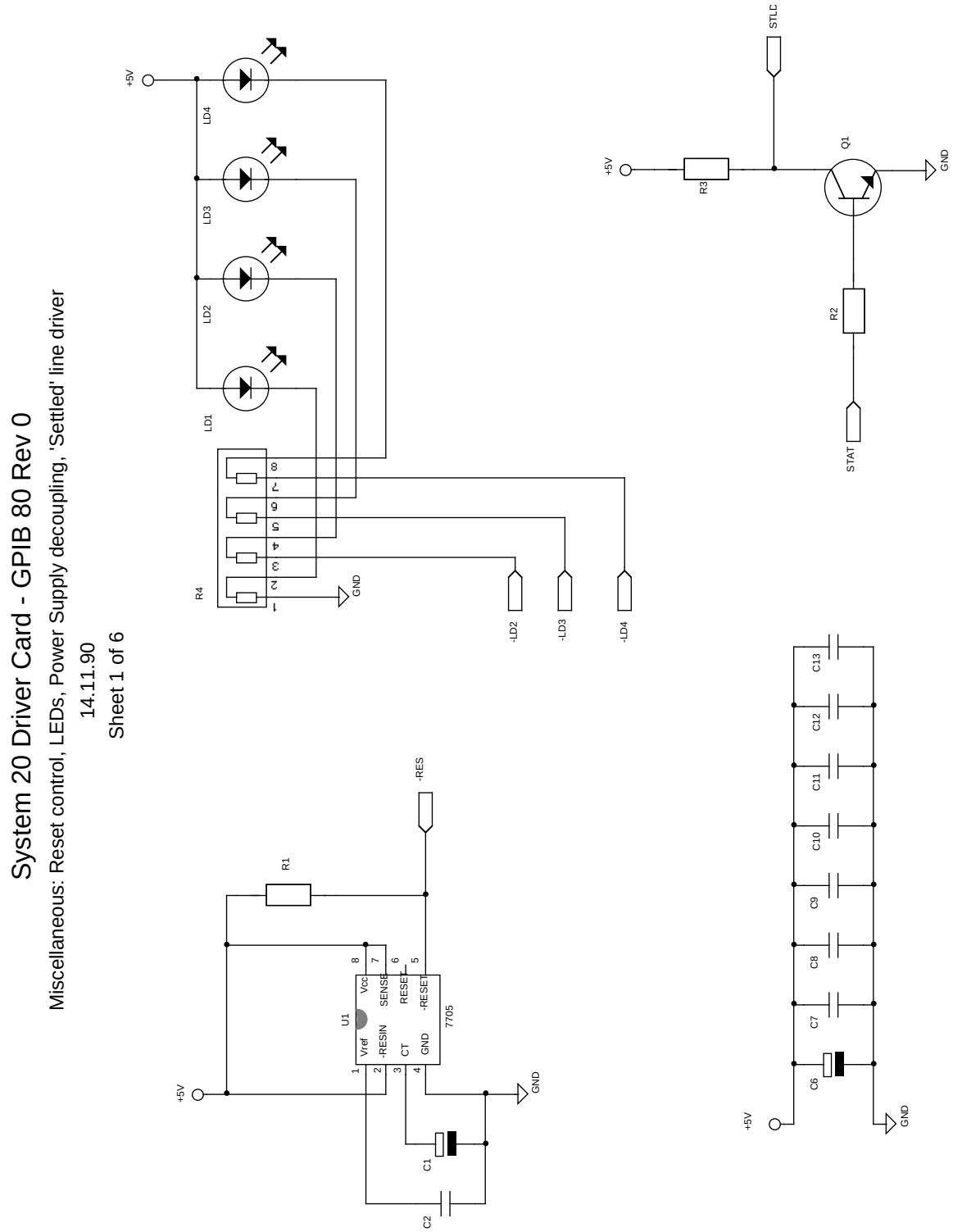
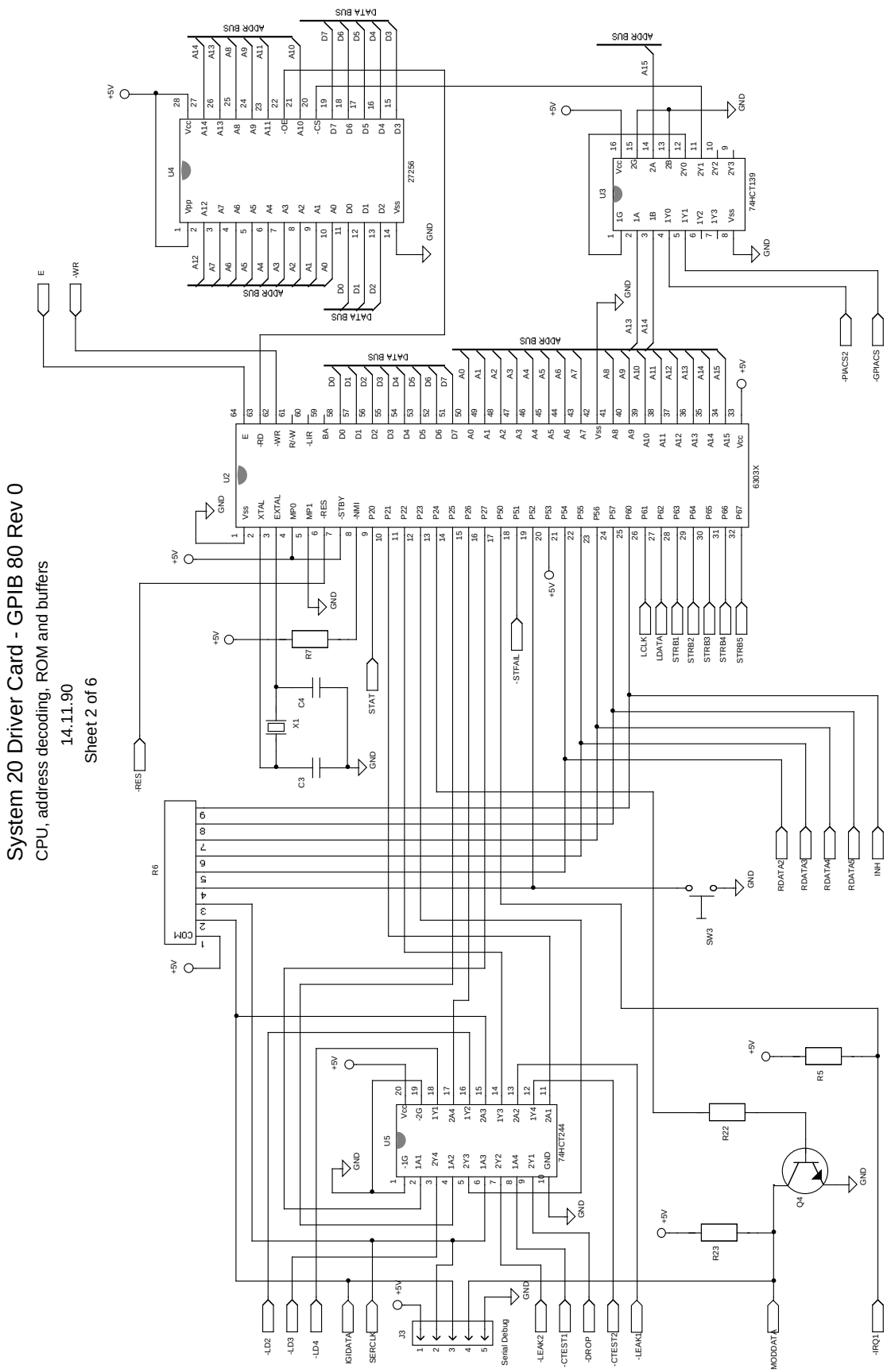


Fig 8.1 Driver PCB Layout


System 20 Driver Card - GPIB 80 Rev 0
Miscellaneous: Reset control, LEDs, Power Supply decoupling, 'Settled' line driver
14.11.90
Sheet 1 of 6
+5V
LD4
LD3
LD2
LD1
R4
GND
-LD2
-LD3
-LD4
STLC
R3
Q1
R2
STAT
-RES
R1
U1
Vcc
SENSE
RESET
-RESET
Vref
-RESIN
CT
GND
7705
C1
C2
C13
C12
C11
C10
C9
C8
C7
C6

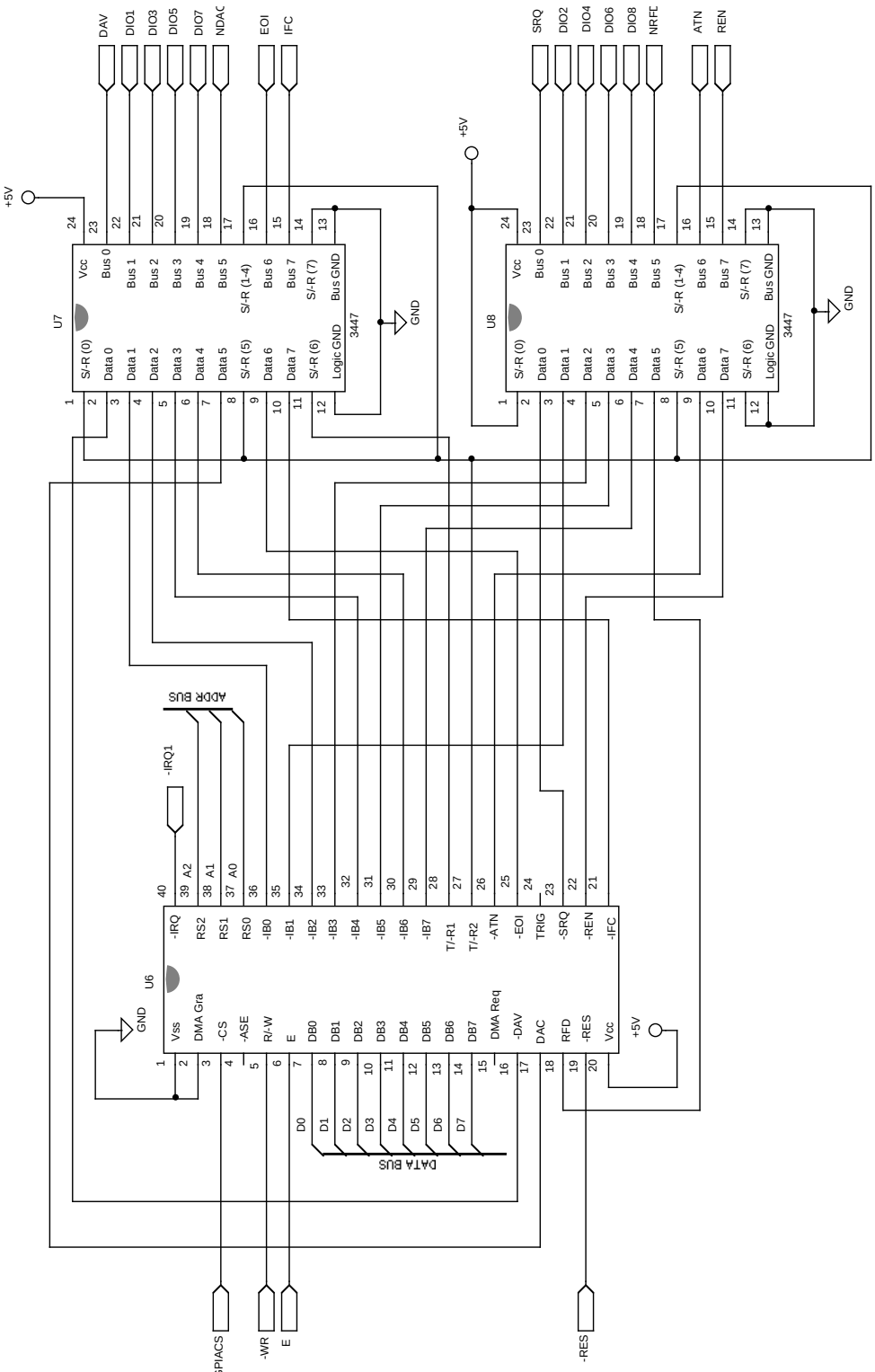

System 20 Driver Card - GPIB 80 Rev 0
CPU, address decoding, ROM and buffers
14.11.90
Sheet 2 of 6

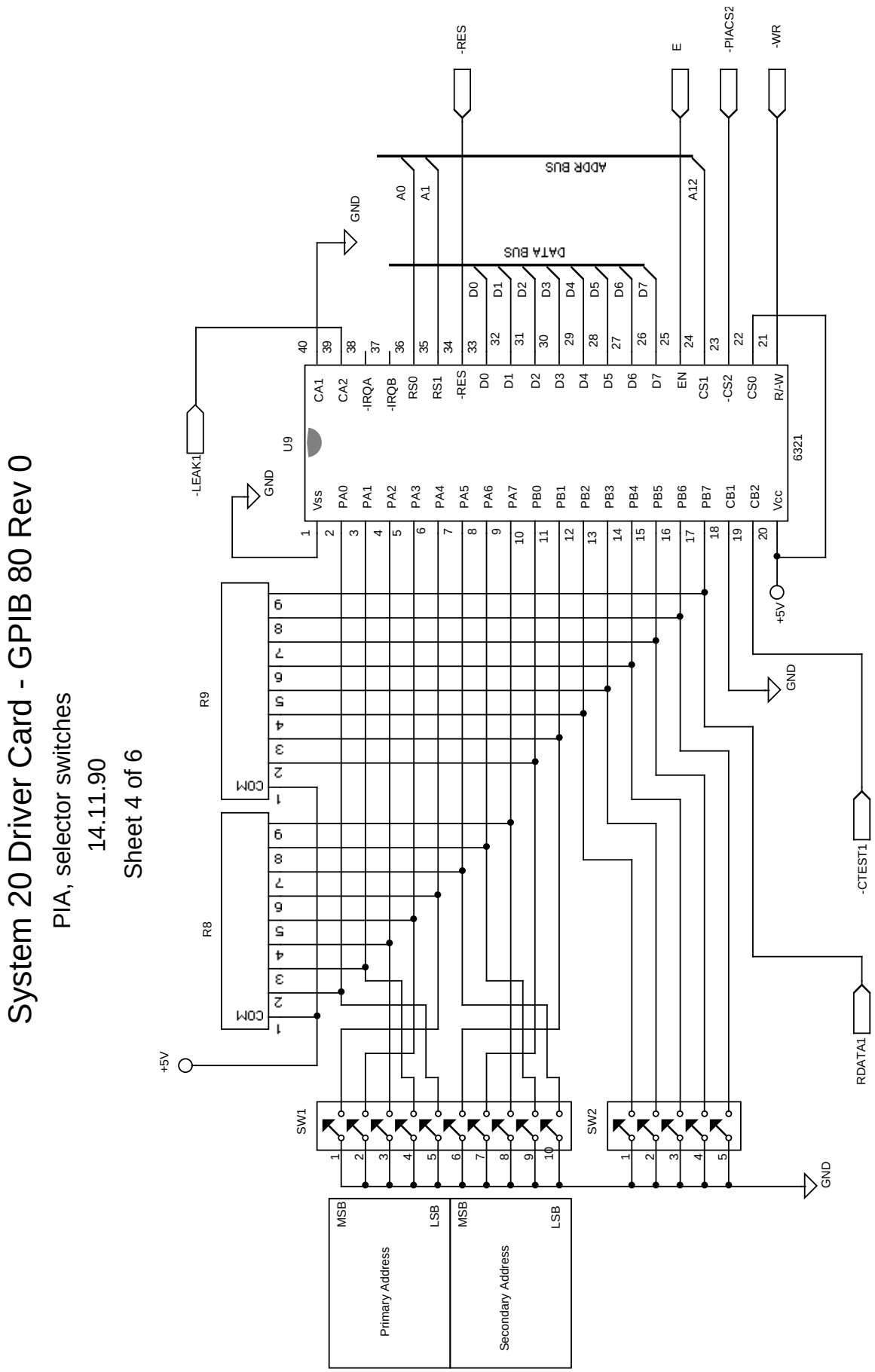
System 20 Driver Card - GPIB 80 Rev 0

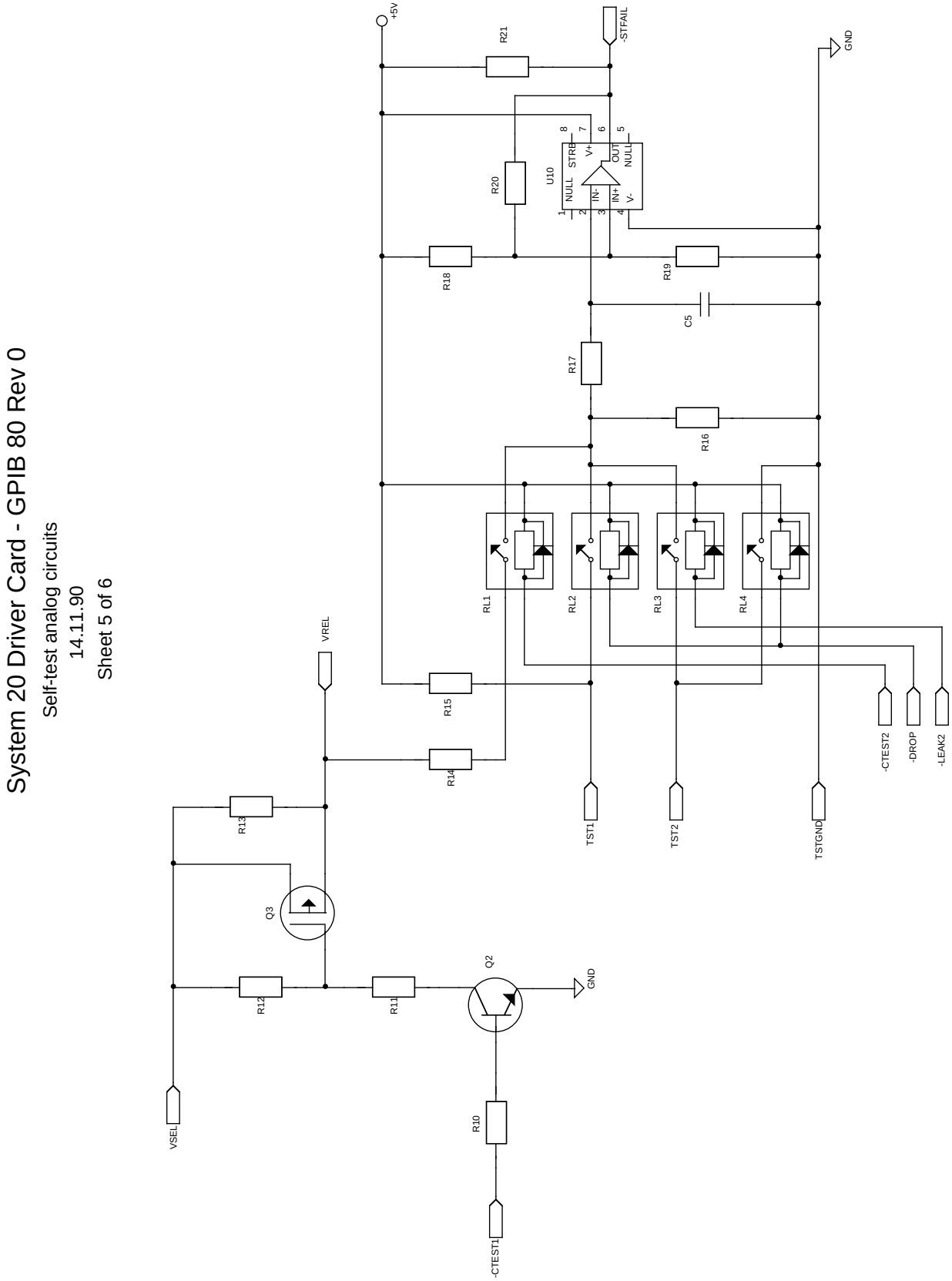
GPIA, bus transceivers

14.11.90

Sheet 3 of 6




System 20 Driver Card - GPIB 80 Rev 0
PIA, selector switches
14.11.90
Sheet 4 of 6
-RES
E
-PIACS2
-WR
ADDR BUS
DATA BUS
A0
A1
A12
GND
-LEAK1
U9
6321
CA1
CA2
-IRQA
-IRQB
RS0
RS1
-RES
D0
D1
D2
D3
D4
D5
D6
D7
EN
CS1
-CS2
CS0
R/-W
Vss
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
CB1
CB2
Vcc
+5V
R9
R8
COM
SW1
SW2
MSB
LSB
Primary Address
Secondary Address
-CTEST1
RDATA1


System 20 Driver Card - GPIB 80 Rev 0
Self-test analog circuits
14.11.90
Sheet 5 of 6
+5V
R21
-STFAIL
GND
U10
NULL
STRB
V+
OUT
NULL
IN-
IN+
V-
R20
R18
R19
C5
R17
R16
RL1
RL2
RL3
RL4
VREL
R15
R14
R13
Q3
Q2
R12
R11
R10
VSEL
-CTEST1
TST1
TST2
TSTGND
-CTEST2
-DROP
-LEAK2

Note :-

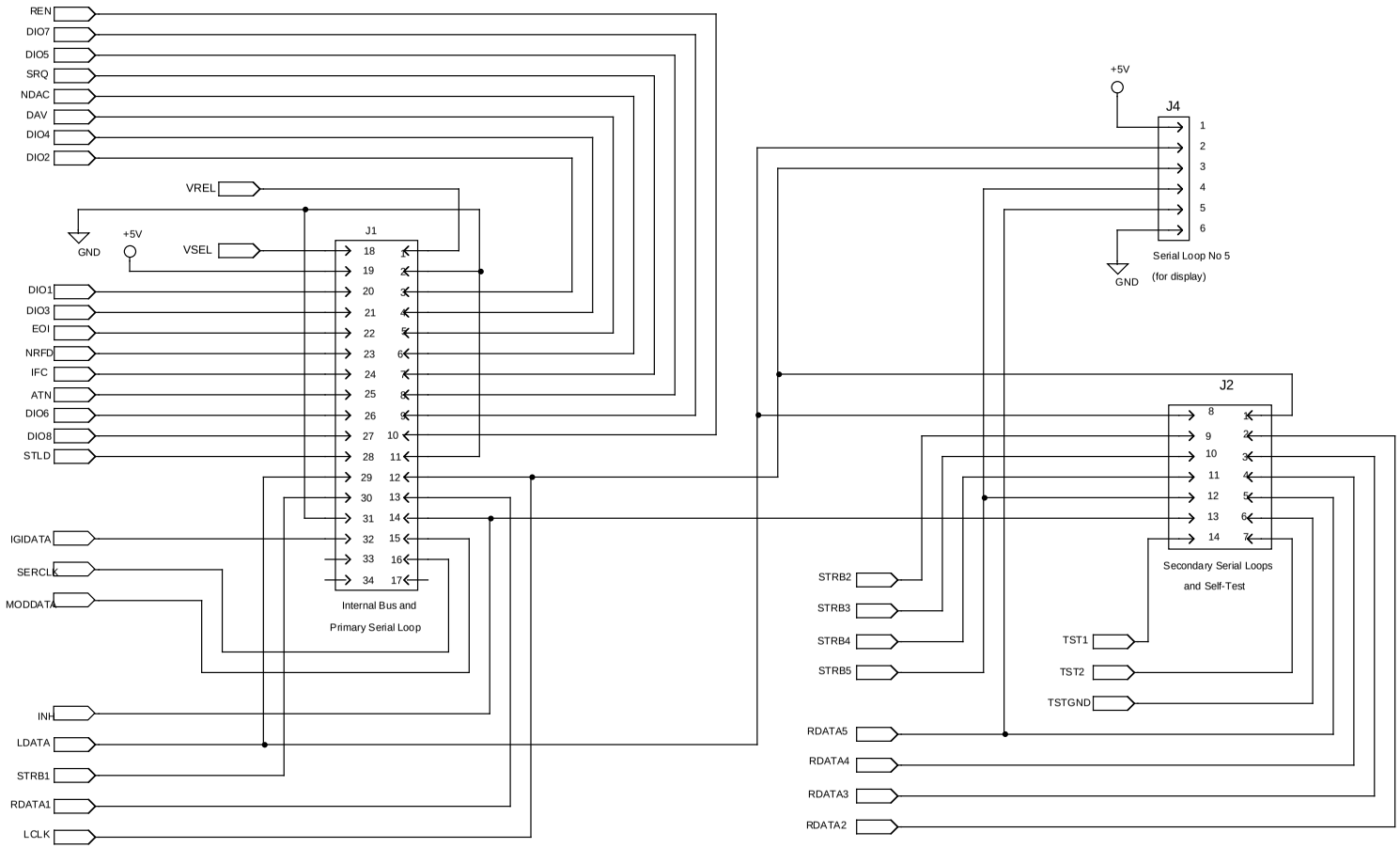
The pin rows of connectors J1, J2 are interchanged relative to their physical positions.

System 20 Driver Card - GPIB 80 Rev 0

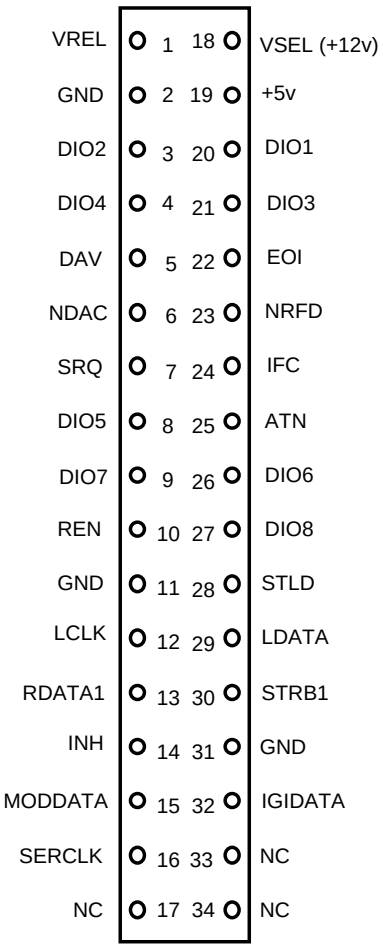
Inter-PCB Connectors

14.11.90

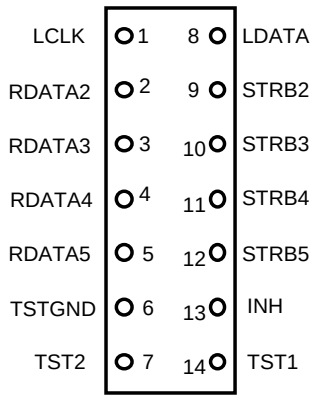
Sheet 6 of 6



GPIB80 System 20 Driver Card inter-PCB connectors (from component side)


VREL 1 18 VSEL (+12v)
GND 2 19 +5v
DIO2 3 20 DIO1
DIO4 4 21 DIO3
DAV 5 22 EOI
NDAC 6 23 NRFD
SRQ 7 24 IFC
DIO5 8 25 ATN
DIO7 9 26 DIO6
REN 10 27 DIO8
GND 11 28 STLD
LCLK 12 29 LDATA
RDATA1 13 30 STRB1
INH 14 31 GND
MODDATA 15 32 IGIDATA
SERCLK 16 33 NC
NC 17 34 NC

Primary connector



Secondary connector

Note :
Pin numbering is PIL convention only (not industry standard)

Parts List for GPIB80 Rev0 PCB Assembly

PCB Location	PIL Part Number	Part Description
R1	C/RS/012	Res 6k8Ω 5% 1/4W
R2	C/RS/012	Res 6k8Ω 5% 1/4W
R3	C/RS/012	Res 6k8Ω 5% 1/4W
R4	C/RS/016	Res 8-pin SIP, 4 x 330R separate
R5	C/RS/012	Res 6k8Ω 5% 1/4W
R6	C/RS/013	Res 9-pin SIP, 8 x 10k commoned
R7	C/RS/012	Res 6k8Ω 5% 1/4W
R8	C/RS/013	Res 9-pin SIP, 8 x 10k commoned
R9	C/RS/013	Res 9-pin SIP, 8 x 10k commoned
R10	C/RS/025	Res 22kΩ 5% 1/4W
R11	C/RS/012	Res 6k8Ω 5% 1/4W
R12	C/RS/024	Res 180kΩ 5% 1/4W
R13	C/RS/025	Res 22kΩ 5% 1/4W
R14	C/RS/026	Res 470kΩ 5% 1/4W
R15	C/RS/027	Res 470RΩ 5% 1/4W
R16	C/RS/025	Res 22kΩ 5% 1/4W
R17	C/RS/024	Res 180kΩ 5% 1/4W
R18	C/RS/012	Res 6k8Ω 5% 1/4W
R19	C/RS/005	Res 180RΩ 5% 1/4W
R20	C/RS/024	Res 180kΩ 5% 1/4W
R21	———	Omit
R22	C/RS/012	Res 6k8Ω 5% 1/4W
R23	C/RS/012	Res 6k8Ω 5% 1/4W
Q1	C/SC/001	Transistor BC182L
Q2	C/SC/001	Transistor BC182L
Q3	C/SC/018	Transistor RFP 12P08
Q4	C/SC/001	Transistor BC182L
RL1	C/RL/000	Reed Relay 109-1-A-5/2D
RL2	C/RL/000	Reed Relay 109-1-A-5/2D
RL3	C/RL/000	Reed Relay 109-1-A-5/2D
RL4	C/RL/000	Reed Relay 109-1-A-5/2D
U1	C/IC/019	IC DIG 7705
U2	C/IC/018	IC DIG 63B03X
U3	C/IC/028	IC DIG 74HCT139
U4	C/IC/024	IC DIG 27256 EPROM
U5	C/IC/033	IC DIG 74HCT244
U6	C/IC/020	IC DIG 68488P
U7	C/IC/021	IC DIG 3447
U8	C/IC/021	IC DIG 3447
U9	C/IC/016	IC DIG 63B21
U10	C/IC/037	IC LIN CA3140E
C1	C/CP/009	Cap 10uF elect
C2	C/CP/005	Cap 100nF
C3	C/CP/010	Cap 22pF
C4	C/CP/010	Cap 22pF
C5	C/CP/005	Cap 100nF
C6	C/CP/003	Cap 22uF tant
C7	C/CP/001	Cap 10nF
C8	C/CP/001	Cap 10nF
C9	C/CP/001	Cap 10nF
C10	C/CP/001	Cap 10nF
C11	C/CP/001	Cap 10nF
C12	C/CP/001	Cap 10nF
C13	C/CP/001	Cap 10nF
SW1	C/SW/005	DIP Switch 10-pole dip piano key

SW2	C/SW/001	DIP Switch 5-pole dip slide
SW3	C/SW/004	Switch 1pst p/button
LD1	C/SC/004	LED (red)
LD2	C/SC/007	LED (green)
LD3	C/SC/004	LED (red)
LD4	C/SC/008	LED (yellow)
X1	C/MS/000	Xtal 4.00 MHz
J1	C/CN/097	34-way pin header (2 row, gold pl.)
J2	C/CN/077	14-way pin header (2 row, gold pl.)
J3	———	
J4	C/CN/110	6-way pin header (1 row)
	C/PC/086	PCB 6U PTH

8.2 8 x 8 Single Pole Relay PCB Assembly

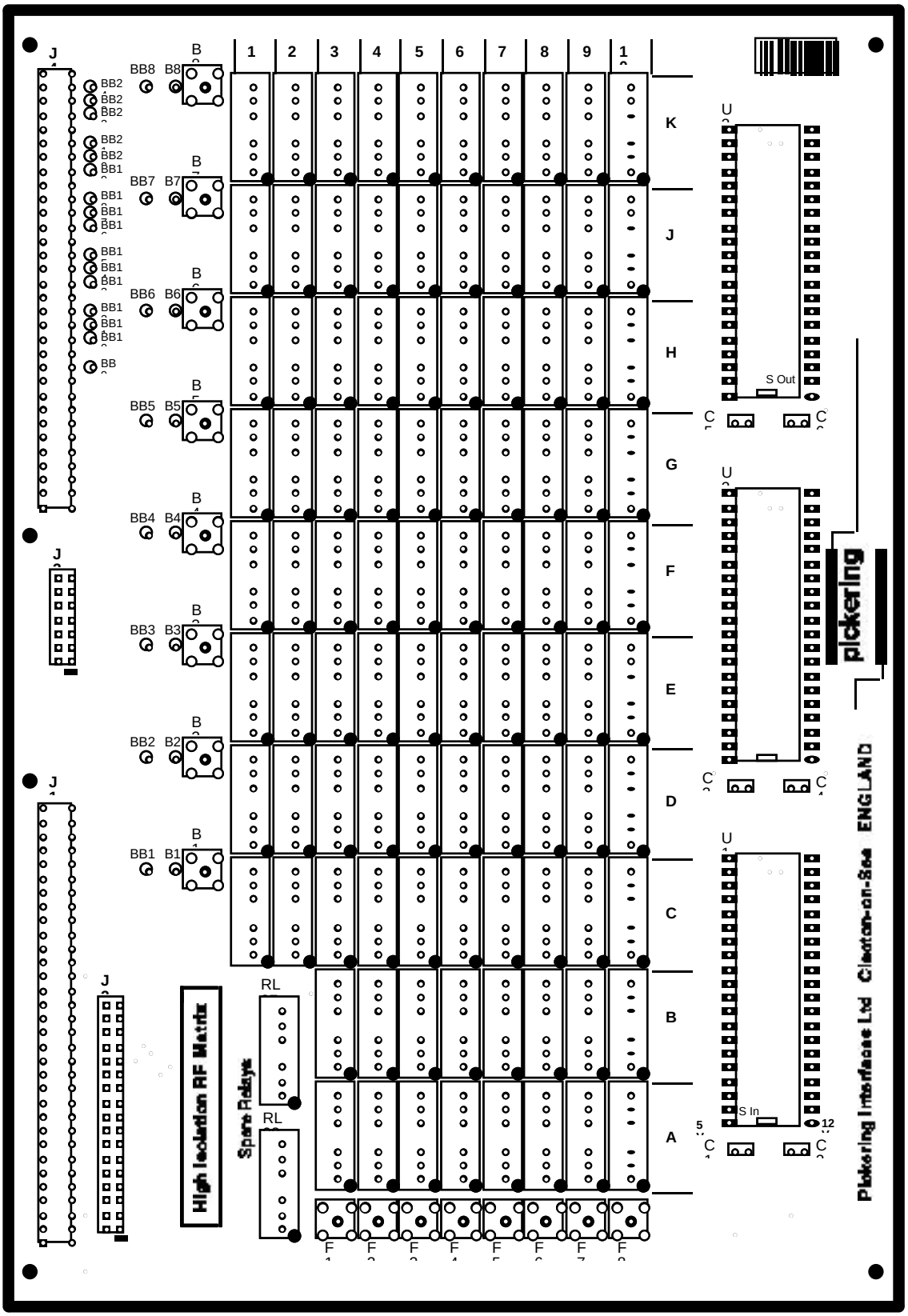
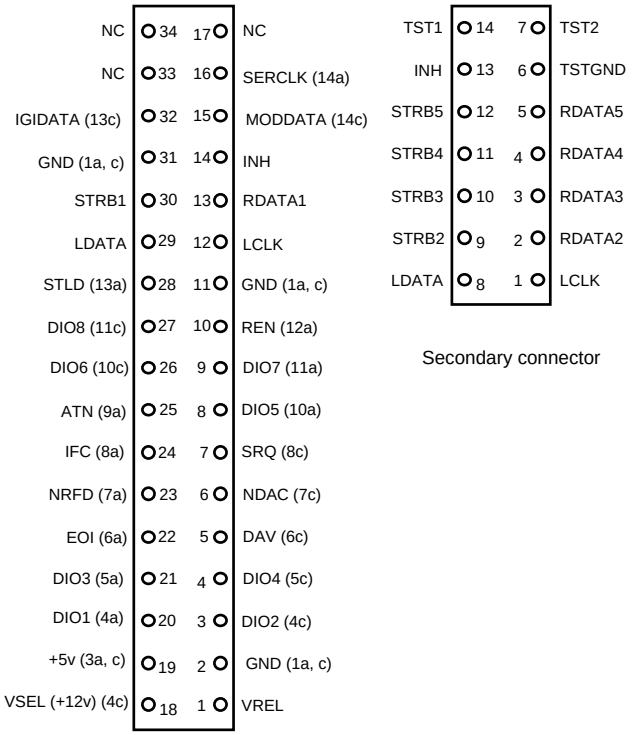


Fig 8.8 Relay PCB Layout

System 20 Relay Card inter-PCB connectors (from component side)


NC 34 17 NC
NC 33 16 SERCLK (14a)
IGIDATA (13c) 32 15 MODDATA (14c)
GND (1a, c) 31 14 INH
STRB1 30 13 RDATA1
LDATA 29 12 LCLK
STLD (13a) 28 11 GND (1a, c)
DIO8 (11c) 27 10 REN (12a)
DIO6 (10c) 26 9 DIO7 (11a)
ATN (9a) 25 8 DIO5 (10a)
IFC (8a) 24 7 SRQ (8c)
NRFD (7a) 23 6 NDAC (7c)
EOI (6a) 22 5 DAV (6c)
DIO3 (5a) 21 4 DIO4 (5c)
DIO1 (4a) 20 3 DIO2 (4c)
+5v (3a, c) 19 2 GND (1a, c)
VSEL (+12v) (4c) 18 1 VREL
TST1 14 7 TST2
INH 13 6 TSTGND
STRB5 12 5 RDATA5
STRB4 11 4 RDATA4
STRB3 10 3 RDATA3
STRB2 9 2 RDATA2
LDATA 8 1 LCLK

Primary connector backplane bus pin connects in brackets

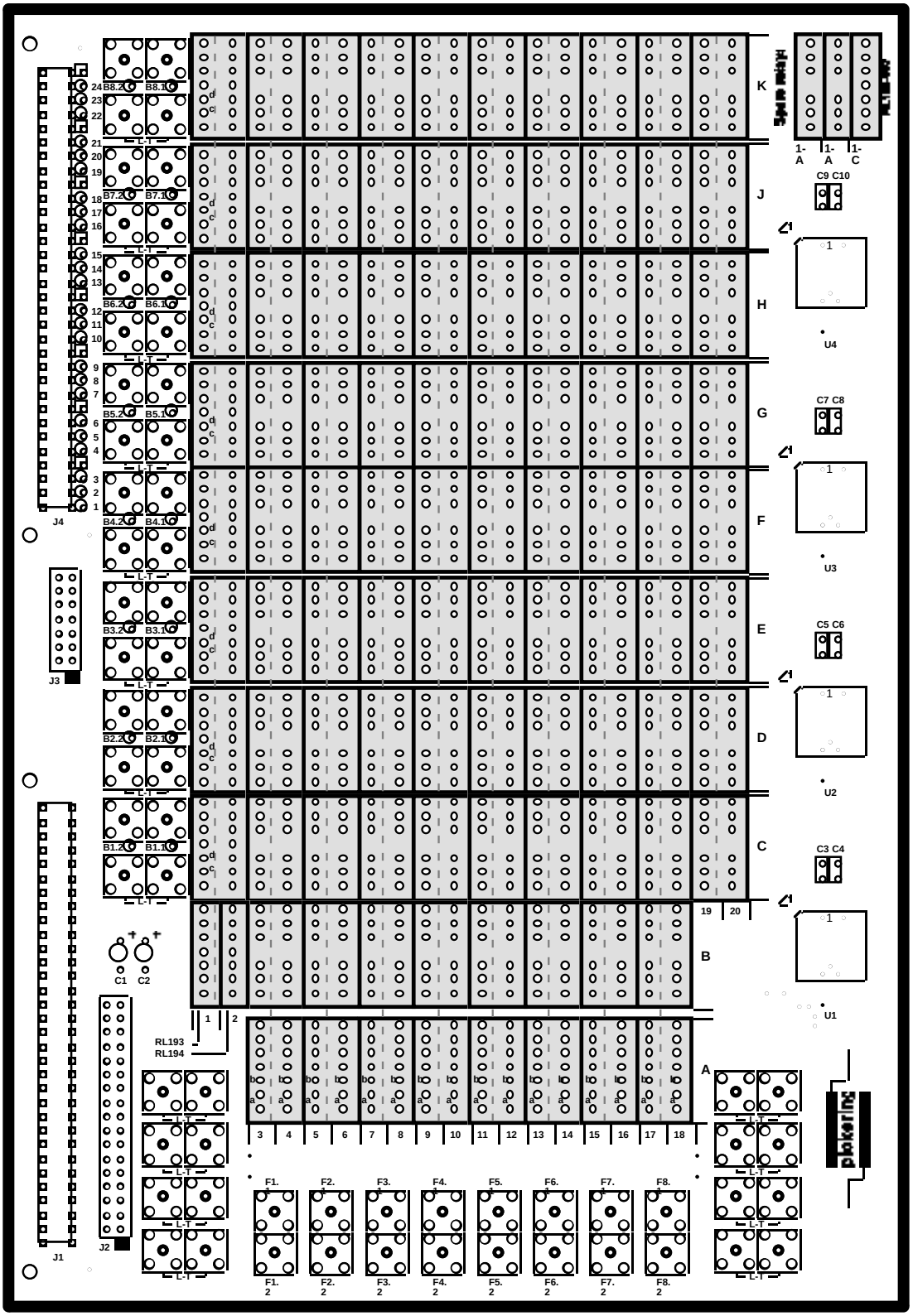
Secondary connector

Note :
Pin numbering is PIL convention only (not industry standard)

Parts List for GPIB86 Rev0 Relay (1 Pole) PCB Assembly

PCB Location	PIL Part Number	Part Description
J1, J4	C/CN/001	Connector DIN 41612 64 Way A/C
J3	C/CN/077	Header 14 pin 2 row
J2	C/CN/000	Header 34 pin 2 row
B1..B8	C/CN/118	PC Mount Dielectric FeedThru 2, 6/50
F1..F8	C/CN/118	PC Mount Dielectric FeedThru 2, 6/50
C1..C6	C/CP/001	Cap 10nF
RL1..RL98		RF Reed Relay See Sec 1.3 for type
U1..U3	C/IC/026	IC DIG UCN 5818A
	C/PC/086	PCB 6U 4 Layer

8.3 8 x 8 Double Pole Relay PCB Assembly



Note: Self Test Fails are diagnosed down to a pair of reed relays (so both relays must be removed), the pairs are shown above.

Parts List for GPIB110 Rev0 Relay (2 Pole) PCB Assembly

PCB Location	PIL Part Number	Part Description
J1, J4	C/CN/001	Connector DIN 41612 64 Way A/C
J2	C/CN/124	34 Way Mini-DIP Transition Connector
J3	C/CN/128	14 Way Mini-DIP Transition Connector
B1..B8	C/CN/118	PC Mount Dielectric FeedThru 2, 6/50
F1..F8	C/CN/118	PC Mount Dielectric FeedThru 2, 6/50
C1, C2	C/CP/003	Cap Tant 22uF 16V
C3..C10	C/CP/001	Cap Cer 10nF 50V
RL(A3-K20),195,196		RF Reed Relay, See Sec 1.3 for type
RL193,194,197	C/RL/057	107-1-C-12/3D
U1..U4	C/IC/035	IC DIG UCN 5818EPF
	C/PC/110	PCB 6U 4 Layer

Section 9
Adapting Matrix for Analogue Bus Connection

9.1 Configuring Matrix for Analogue Bus Connection

All RF matrix modules are shipped from the factory configured for front panel interconnection (please refer to Sec 2.5), therefore if the analogue bus is to be used then the module should be ordered in that configuration or the module must be modified by the user.

To reconfigure the matrix module for analogue bus connection for a single pole 8 x 8 matrix:-

- Remove all Coaxial Launchers, locations B1, B2,..... B8 on relay PCB.
- Connect links BB8 to B8, BB7 to B7 .....BB1 to B1.

The operation is similar for 16 x 4 and all double pole versions. Please contact factory if you require further information or assistance, module can also be returned to Pickering for modification.

Section 10
Electrical, Environmental, Mechanical & Firmware Specifications

Environmental

Operating Temperature 0°C to 50°C.

Storage Temperature -20°C to 75°C.

Humidity 95% non condensing.

Weight Dimensions and Power Requirements

Approx. Weight/g		1000
Dimensions/mm †		
Front Panel Width		60.5
Height		268
Overall Length		189
Power /Current Consumption		
Maximum /mA	5V	250
	12V	1000
Minimum	5V	150
	12V	0

† Approx. dimensions. Standard 160mm, 6U, Eurocard, as specified in DIN 41494.

Voltage Supplies

Logic Supply 5Vdc ±5%.

Relay Supply 12Vdc ±10%

Current Firmware Revision**: 2.00**